REMARKS

The Applicant has received and reviewed the Office Action dated September 6, 2006 wherein the Office rejected claims 1, 2, 10, 14, 15, 17, 19, 20, 22, 23, 26, 27, 29, and 30 under 35 U.S.C. §102(e) as being anticipated by the reference of Mershon et al. (U.S. Patent Publication No. US2005/0063637); rejected claims 1, 3-9, 11, 13, 16-18, 21, and 26-28 under 35 U.S.C. § 103(a) as being unpatentable over the combination of the references of Mershon et al. and Allman et al. (U.S. Patent No. 6,324,313); and rejected claims 17 and 24-25 under 35 U.S.C. §103(a) as being unpatentable over the combination of the references of Mershon et al. and Thomas (U.S. Patent No. 5,198,008).

Rejection under 35 U.S.C &102(e) to Mershon et al.

Applicant's claims 1, 2, 10, 14, 15, 17, 19, 20, 22, 23, 26, 27, 29, and 30 stand rejected under 35 U.S.C. § 102(e) as being anticipated by the reference of Mershon et al. (U.S. Patent Publication No. US2005/0063637). The Applicant respectfully disagrees with the Office's aforementioned rejection.

In regards to Applicant's independent claims 1, 10, 17, 26, 29, and 30, Applicant's independent claim 1 has been amended to now call for an optical coupling element comprising:

> "... a translucent body configured to be received within a hole including an optical entry/exit face and at least one optical entry/exit stacking face, said translucent body having a flat top surface, a flat end surface, and a cylindrical shape for rotationally aligning the translucent body at a desired angular position;..." (Emphasis added.)

Applicant's independent claim 10 has been amended to now call for a multi-layer device that includes a:

> "... optical coupling element having a flat top surface, a flat end surface, and a solid cylindrical shaped body for rotationally aligning the optical coupling element at a desired angular position, said optical coupling element including a first light directing member therein for receiving a light signal from said first layer." (Emphasis added.)

Applicant's independent claim 17 has been amended to now call for a method of forming a light conducting path between at least two substrates including the step of:

> "... extending a cylindrical shaped optical coupling element having a flat top surface and a flat end surface into the via to permit a light signal to be transferred between adjacent substrates through the optical coupling element." (Emphasis added.)

Applicant's independent claim 26 has been amended to now call for a substrate that includes:

> "... an optical interconnection device comprising two cylindrical shaped optical coupling elements each having a flat top surface and a flat end surface with the optical coupling elements stacked in an end-to-end condition and with at least one of said optical coupling elements having an entry/exit face positioned at the first level in the substrate and at least one of said optical coupling elements having an entry/exit face positioned at the second level of the substrate to permit a light signal transfer from the first level in the substrate to the second level in the substrate or vice versa." (Emphasis added.)

Applicant's independent claim 29 has been amended to now call for an optical coupling element that includes:

> "...a cylindrical shaped translucent body for rotationally aligning the translucent body at a desired angular position, said translucent body having a flat top surface, a flat end surface and an entry/exit face positioned at the first level and an entry/exit face positioned at the second level to permit a light signal transfer from the first level to the second level or vice versa." (Emphasis added.)

Applicant's independent claim 30 has been amended to now call for an optical coupling element comprising:

> "...a solid cylindrical shaped translucent body having a flat top surface and a flat end surface;..." (Emphasis added.)

Support for the Applicant's above amendment can be found for example in Applicant's second dependent claim 4, and dependent claims 8, and 28, which all have been canceled from the present case and on page 5, lines 8-10; page 6, lines 10-19; page 7, lines 9-24; and on page 8, lines 7-19 of the Applicant's disclosure.

The Applicant respectfully submits that the reference of Mershon et al. does not teach the above features of Applicant's amended independent claims 1, 10, 17, 26, 29, and 30. More specifically, it is submitted that the reference of Mershon et al. does not teach an optical coupling element having a cylindrical shaped body and a flat top surface and a flat end surface as called for in Applicant's amended independent claims 10 and 26 or the step of "... extending a cylindrical shaped optical coupling element having a flat top surface and a flat end surface into the via ..." as called for in Applicant's amended independent method claim 17.

The Applicant respectfully submits that the reference of Mershon et al. also does not teach an optical coupling element comprising a cylindrical shaped translucent body having a flat top surface and a flat end surface as called for in Applicant's amended independent claims 1, 29, and 30. It is noted that that providing for a cylindrical shaped optical coupling element or a cylindrical shaped translucent body allows for the rotationally aligning of the cylindrical shaped optical coupling element and the cylindrical shaped translucent body at a desired angular position without changing the axial position, a feature also not taught by the reference of Mershon et al.

The Applicant respectfully submits that the reference of Mershon et al. further does not teach an optical coupling element having a solid cylindrical shaped body as called for in Applicant's amended independent claim 10 or an optical coupling element comprising a solid cylindrical shaped translucent body as called for in Applicant's amended independent claim 30.

On page 3, lines 13-20 of the Office Action in support of the Office's rejection of Applicant's claims 1, 2, 10, 14, 15, 17, 19, 20, 22, 23, 26, 27, 29, and 30, the Office stated that the reference of Mershon et al, in paragraph 18-32 and Figs. 2, 5, and 6, teaches "... extending a translucent optical element into the via." The Applicant respectfully but strenuously disagrees with the Office's aforementioned statement. It is submitted that the Applicant's review of paragraph 18-32 and Figs. 2, 5, and 6 of the Mershon et al. reference failed to reveal the teaching of a translucent optical element located in Mershon et al.'s via 230. It is further submitted that the reference of Mershon et al. instead teaches

away from a translucent optical element located in Mershon et al.'s via 230 through Mershon et al.'s disclosure in paragraph 0023 that:

> "The first optical via 230 may allow transmission of light to or from the first device 226 to a first optical redirector 234. The first optical via 230 may be a tube that directs light to or from the first optical redirector 234, may be a well defined by sidewalls of the layers 214, 204 through which it passes, ..." (Emphasis added.)

The Applicant respectfully submits that Mershon et al.'s above disclosure of the use of Mershon et al.'s first optical via 230 as either comprising a tube or a well defined by sidewalls of Mershon et al.'s layers 214, 204 for allowing the transmission of light is different form the cylindrical shaped translucent body of Applicant's amended independent claims 1, 29, and 30 or the optical coupling element of Applicant's amended independent claims 10, 17 and 26. Note for example that Applicant's amended independent claim 10 specifically calls for an "...optical coupling element located in said via ...," Applicant's amended independent method claim 17 calling for the step of extending an optical coupling element into the via, and Applicant's amended independent claim 1 calling for "a translucent body configured to be received within a hole."

It is for the above reasons that the Applicant respectfully submits that Applicant's amended independent claims 1, 10, 17, 26, 29, and 30 are allowable over the reference of Mershon et al.

Rejection under 35 U.S.C §103(a) to the
combination of Mershon et at. and Allman et al.

Applicant's claims 1, 3-9, 11, 13, 16-18, 21, and 26-28 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the combination of the references of Mershon et al. and Allman et al. (U.S. Patent No. 6,324,313). It is noted that the second dependent claim 4 and dependent claims 8, and 28 have been canceled from the present case.

In support of the Office's above rejection, the Office on page 4, lines 7-15 of the Office Action stated:

> "Mershon teaches an optical coupling element and method of forming a light conducting path between substrates as discussed above. However, Mershon does not explicitly teach the coupling of light (and the corresponding additional structures) between multiple layers in an optical printed circuit board. However, as multiple layer printed circuit boards are common in the art (e.g. as taught by Mershon) and coupling between multiple layers is also known to those skilled in the art (e.g. Allman et al 6,324,313) it would have been obvious to one of ordinary skill in the art at the time of the invention to extend the two layer optical interconnect of Mershon into three or more layers because this would allow efficient operation of a multi-layer optical printed circuit." (Emphasis added.)

The Applicant agrees with the Office's above statement that the reference of Mershon does not teach the coupling of light between multiple layers in an optical printed circuit board. The Applicant however respectfully disagrees with the Office above statement that the reference of Mershon teaches the optical coupling element of Applicant's independent claims 1, 9, and 26 and the method of Applicant's independent claim 17.

In regards to Applicant's independent claim 9, Applicant's independent claim 9 has been amended to now call for an optical device that includes a:

"...transparent element having a flat top surface, a flat end surface, and a cylindrical shape body for rotationally aligning the optical coupling elements at a desired angular position; ..." (Emphasis added.)

Support for the Applicant's above amendment can be found for example in Applicant's canceled second dependent claim 4, and dependent claims 8, and 28 and on page 5, lines 8-10; page 6, lines 10-19; page 7, lines 9-24; and on page 8, lines 7-19 of the Applicant's disclosure.

In regards to Applicant's independent claim 1, 17, and 26, as previously noted, Applicant's independent claim 1, as amended, now calls for an optical coupling element comprising a cylindrical shaped translucent body having a flat top surface and a flat end surface. Applicant's independent method claim 17, as amended, now includes the step of: "... extending a cylindrical shaped optical coupling element having a flat top surface and a flat end surface into the via ..." Applicant's independent claim 26, as amended, now calls for an optical coupling element having a cylindrical shaped body and a flat top surface and a flat end surface.

The Applicant respectfully submits that the combination of the references of Mershon et al. and Allman et al. does not teach the above features of Applicant's amended independent claims 1, 9, 17, and 26, as the Applicant's review of the reference of Mershon et al. and the reference of Allman et al. revealed that the references of Mershon et al. and Allman et al. each failed to disclose a transparent element having a flat top surface, a flat end surface, and a cylindrical shape body as called for in Applicant's

amended independent claim 9, an optical coupling element having a cylindrical shaped body and a flat top surface and a flat end surface as called for in Applicant's amended independent claim 26, the step of "... extending a cylindrical shaped optical coupling element having a flat top surface and a flat end surface into the via ..." as called for in Applicant's amended independent method claim 17 or an optical coupling element comprising a cylindrical shaped translucent body having a flat top surface and a flat end surface as called for in Applicant's amended independent claim 1.

Since the references of Mershon et al. and Allman et al. each do not teach the above features of Applicant's amended independent claims 1, 9, 17, and 26, the Applicant respectfully submits that their combination also does not teach the above features of Applicant's amended independent claims 1, 9, 17, and 26.

It is for the above reasons that the Applicant respectfully submits that Applicant's independent claims 1, 9, 17, and 26, as amended, are allowable over the combination of the references of Mershon et al. and Allman et al.

Rejection under 35 U.S.C §103(a) to the
combination of Mershon et at. and Thomas

Applicant's claims 17 and 24-25 stand rejected under 35 U.S.C. §103(a) as being unpatentable over the combination of the references of Mershon et al. and Thomas (U.S. Patent No. 5,198,008).

In support of the Office's above rejection, the Office on page 4, lines 16-23 of the Office Action stated:

> "Mershon teaches an optical coupling element and method of forming a light conducting path between substrates as discussed above. However, Mershon does not explicitly teach employing buried or blind vias. As such vias are well know in the art, for example as taught by Thomas, it would have been obvious to one of ordinary skill in the art at the time of the invention to employ buried and blind vias in the invention of Mershon because this would allow greater flexibility in circuit design and construction."

The Applicant agrees with the Office's above statement that the reference of Mershon does not teach buried or blind vias. The Applicant however respectfully disagrees with the Office above statement that the reference of Mershon teaches the method of Applicant's independent claim 17. As previously noted, Applicant's independent method claim 17 has been amended now calls for the step of "... extending a cylindrical shaped optical coupling element having a flat top surface and a flat end surface into the via ..."

The Applicant respectfully submits that the combination of the references of Mershon et al. and Thomas does not teach the above features of Applicant's amended independent claim 17 as the Applicant's review of the reference of Mershon et al. and the reference of Thomas revealed that the references of Mershon et al. and Thomas each failed to disclose the step of "... extending a cylindrical shaped optical coupling element having a flat top surface and a flat end surface into the via ..." as called for in Applicant's amended independent method claim 17.

In further regards to the reference of Mershon et al., the Applicant submits that the reference of Mershon et al. teaches away from the step of "... extending a cylindrical shaped optical coupling element having a flat top surface and a flat end surface into the via ..." of Applicant's amended independent claim 17 by disclosing of the use of Mershon et al.'s first optical via 230 as either comprising a tube or a well defined by sidewalls of Mershon et al.'s layers 214, 204 for allowing the transmission of light.

In further regards to the reference of Thomas, the Applicant submits that the reference of Thomas does not teach the step of "... extending a cylindrical shaped optical coupling element having a flat top surface and a flat end surface into the via ..." of Applicant's amended claim 17 but instead discloses in Figures 1(C), I (D),1(E), 1(F), 1(G), 1(H), 1(I), and 3 the method of forming core glass interconnects 22 and 30 each having an L-shaped cross-section. Note that Figure 2 of the reference of Thomas specifically shows a portion of Thomas' core glass interconnect 30 as having a square-shape.

Since the references of Mershon et al. and Thomas each do not teach the method of Applicant's amended independent claim 17, and more specifically, the step of "... extending a cylindrical shaped optical coupling element having a flat top surface and a flat end surface into the via ... ", the Applicant respectfully submits that the combination of the references of Mershon et al. and Thomas also does not teach the method of Applicant's amended independent claim 17.

It is for the above reasons that the Applicant respectfully submits that Applicant's independent claims 17 and 24-25, as amended, are allowable over the combination of the references of Mershon et al. and Thomas.

In further regards to Applicant's dependent claims 2-7, 11-16, 18-25, and 27, Applicant's dependent claims 2-7 each depend on Applicant's independent claim 1 and Applicant's dependent claims 11-16 each depend on Applicant's independent claim 10. Since Applicant's independent claim 1 and Applicant's independent claim 10, as amended, are allowable for the reasons given above, Applicant's dependent claims 2-7, and 11-16 should also be allowable.

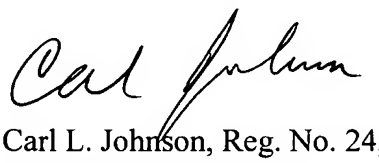
Applicant's dependent claims 18-25 each depends on Applicant's independent claim 17 and Applicant's dependent claim 27 depends on Applicant's independent claim 26. Since Applicant's independent claim 17 and Applicant's independent claim 26, as amended, are allowable for the reasons given above, Applicant's dependent claims 18-25 and 27 should also be allowable.

In view of the above, it is submitted that the application is in condition for allowance. Allowance of claims 1-7, 9-27, and 29-30, as amended, is respectfully requested. Applicant has enclosed a version of the amendment showing changes made with this response.

A response to the Office Action for the present case was due on December 6, 2006. The Applicant hereby petitions for a one-month time extension up to and including the date of January 6, 2006 to file the response. The Applicant has enclosed a petition form PTO/SB/22 form and a credit card authorization form in the amount of $120.00 for payment of the time extension fee. The Applicant is a large entity. The Applicant has also enclosed an executed PTO/SB/30 transmittal form for the filing of a Request for Continued Examination of the above-identified application under 37 C.F.R. 1.114 along with a credit card authorization form in the amount of $790.00 in payment of the filing fee for the request for continued examination. Please charge any additional fees that may be due to Deposit Account 10-0210.

Respectfully submitted,

JACOBSON AND JOHNSON

By 

Carl L. Johnson, Reg. No. 24,273
Attorneys for Applicant
Suite 285
One West Water Street
St. Paul, Minnesota 55107-2080
Telephone: (651) 222-3775
Fax: (651) 222-3776

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Enclosure

VERSION OF AMENDMENTS SHOWING MARKINGS

In the Claims

1. (Currently Amended) An optical coupling element comprising:

a translucent body configured to be received within a hole including an optical entry/exit face and at least one optical entry/exit stacking face, said translucent body having a flat top surface, a flat end surface, and a cylindrical shaped body for rotationally aligning the translucent body at a desired angular position; and

a light directing member secured within the translucent body to direct a light signal between the optical entry/exit face and the at least one optical entry/exit stacking face.

2. (Original) The optical coupling element of claim 1 wherein the light directing member comprises a mirror fixedly embedded in the optical element to deflect the light signal therein.

3. (Original) The optical coupling element of claim 1 wherein the light directing member comprises a light beam splitter/combiner fixedly embedded in said optical element to direct a light beam in at least two different directions.

4. (Original) The optical coupling element of claim 1 wherein the light directing member comprises a light transparent material that directs the light signal from the optical entry/exit face to the further optical entry/exit face without deflecting the light signal.

4. (Canceled)

5. (Previously presented) The optical coupling element of claim 1 wherein the optical coupling element includes at least two light directing members therein.

6. (Original) The optical coupling element of claim 5 wherein the two light directing members are located in optical alignment with each other so that a light signal received by one of the two light directing members is directed into the second of the two light directing members.

7. (Original) The optical coupling element of claim 5 wherein the optical coupling element includes at least three light directing members therein.

8. (Canceled)

9. (Currently Amended) An optical device wherein a plurality of three optical coupling elements are combined in a stack such that when light leaves one of said plurality of optical coupling elements it enters another of said plurality of optical coupling elements with said optical plurality of coupling elements comprise:

at least one of said plurality of optical coupling elements is a transparent element having a light-reflecting element that changes the direction of light that enters the transparent element, said transparent element having flat top surface, a flat end surface,

and a cylindrical shape body for rotationally aligning the optical coupling elements at a desired angular position; and

at least one of said plurality of optical path elements is a transparent element that separates light into two light paths or alternately combines two light paths into one light path.

10. (Currently Amended) A multi-layer device comprising:

a first layer having an optical member therein;

a second layer having a further optical member therein;

a via located in said first layer and said second layer;

an optical coupling element located in said via, said optical coupling element having a flat top surface, a flat end surface, and a solid cylindrical shape body for rotationally aligning the optical coupling elements at a desired angular position, said optical coupling element including a first light directing member therein for receiving a light signal from said first layer.

11. (Original) The multi-layer device of clam 10 wherein the optical coupling element includes a second light directing member for directing the light signal into said second layer.

12. (Original) The multi-layer device of claim 10 including at least two separate optical coupling elements located in a stacked end to end relationship to transmit a light signal from one layer to a second layer.

13. (Original) The multi-layer device of claim 10 including a third layer with an optical coupling element located in each of the layers of multi-layered device.

14. (Original) The multi-layer device of claim 10 wherein the via extends through said first layer and said second layer.

15. (Original) The multi-layer device of claim 10 including a third layer, said third layer having no via therein.

16. (Original) The multi-layer device of claim 10 wherein the vias have a sidewall with the dimensions of the sidewall such that an optical coupling element can be frictionally retained therein.

17. (Currently Amended) ~~The~~ A method of forming a light conducting path between at least two substrates comprising:

stacking a first optical substrate on a second optical substrate;

forming a via in the first optical substrate and the second optical substrate;

extending ~~an~~ a cylindrical shaped optical coupling element having a flat top surface and a flat end surface into the via to permit a light signal to be transferred between adjacent substrates through the optical coupling element.

18. (Original) The method of claim 17 including the step of placing at least two

optical coupling elements in an end to end position in the via.

19. (Original) The method of claim 17 including the step of embedding a light directing member in the optical coupling element.

20. (Original) The method of claim 17 including the step of forming the via through the optical substrates by drilling a hole therein.

21. (Original) The method of claim 17 including the step of embedding at least two light directing members in the optical coupling.

22. (Original) The method of claim 17 including arranging the optical coupling elements in a point-to-point system.

23. (Original) The method of claim 17 including arranging the optical coupling elements in a point-to-many system.

24. (Original) The method of claim 17 including arranging the optical coupling elements in a blind optical via.

25. (Original) The method of claim 17 including arranging the optical coupling elements in a buried optical via.

26. (Currently Amended) A substrate comprising:

a first optical member located at a first level in said substrate;

a second optical member located at a second level in said substrate; and

an optical interconnection device comprising two cylindrical shaped optical coupling elements each having a flat top surface and a flat end surface with the optical coupling members stacked in an end-to-end condition and with at least one of said optical coupling elements having an entry/exit face positioned at the first level in the substrate and at least one of said optical coupling elements having an entry/exit face positioned at the second level of the substrate to permit a light signal transfer from the first level in the substrate to the second level in the substrate or vice versa.

27. (Original) The substrate of claim 26 including a via in said substrate with said optical interconnection device retained therein.

28. (Canceled)

29. (Currently Amended) An optical coupling element comprising:

a first optical member located at a first level;

a second optical member located at a second level; and

a cylindrical shaped translucent body for rotationally aligning the optical coupling elements at a desired angular position, said translucent body having a flat top surface, a flat end surface and an entry/exit face positioned at the first level and an entry/exit face positioned at the second level to permit a light signal transfer from the first level to the

second level or vice versa.

30. (Currently Amended) An optical coupling element comprising:

a solid cylindrical shaped translucent body having a flat top surface and a flat end surface;

a first entry/exit face on said body;

a second entry/exit face on said body; and

means within said translucent body for directing a light signal from said first entry/exit face to said second entry/exit face or vice versa.